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## IV. Environmental Impact Analysis

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### F. Geotechnical

#### 1. Introduction

The following section addresses geotechnical issues such as geologic hazards and the potential impacts attributable to proposed on-site grading activities. Under the heading of geologic hazards, analysis is provided regarding earthquakes and their potential effects, such as fault rupture, seismic groundshaking, liquefaction, and landslides as well as information regarding the potential for flooding to occur at the Project Site and potential impacts associated with the closed on-site landfill. Under the heading of potential impacts attributable to proposed on-site grading activities, analysis is provided regarding on-site soil conditions, which include issues regarding sedimentation, erosion, the presence of expansive soils, construction in areas of artificial fill, groundwater seepage, as well as how proposed grading affects existing landforms found on the Project Site. This section is based upon the *Report of Geotechnical Investigation NBC Universal Evolution Plan* (March 2010) prepared by Shannon & Wilson, Inc. for the proposed Project. The report includes a review of previous geologic and geotechnical reports prepared for the site, site reconnaissance, and review of stereo-paired, vertical, aerial photographs. The full text of the report is included as Technical Appendix H to this Draft EIR. As such, this section of the Draft EIR describes the geologic and seismic setting of the Project area, identifies potential impacts associated with implementation of the proposed Project, and where necessary, recommends mitigation measures to reduce potential impacts.

#### 2. Environmental Setting

##### a. Regulatory Setting

###### (1) State Level

The State of California adopted the 2007 California Building Code, which is based on the 2006 International Building Code, on January 1, 2008. These regulations include provisions for site work, demolition, and construction, which include excavation and grading, as well as provisions for foundations, retaining walls and expansive and compressible soils.

The California Seismic Safety Commission was established by the Seismic Safety Commission Act in 1975 with the intent of providing oversight, review, and

recommendations to the Governor and State Legislature regarding seismic issues. The commission's name was changed to Alfred E. Alquist Seismic Safety Commission in 2006. Since then, the Commission has adopted several documents based on recorded earthquakes, such as the 1994 Northridge earthquake, 1933 Long Beach earthquake, the 1971 Sylmar earthquake, etc. Some of these documents are listed below:

- Research and Implementation Plan for Earthquake Risk Reduction in California 1995 to 2000, report dated December 1994;
- Seismic Safety in California's Schools, 2004, "Findings and Recommendations on Seismic Safety Policies and Requirements for Public, Private, and Charter Schools", report dated December 1994;
- Findings and Recommendations on Hospital Seismic Safety, report dated November 2001; and
- Commercial Property Owner's Guide to Earthquakes Safety, report dated October 2006.

The Alquist-Priolo Geologic Hazards Zone Act was enacted by the State of California in 1972 to address the hazard and damage caused by surface fault rupture during an earthquake. The Act has been amended ten times and renamed the Alquist-Priolo Earthquake Fault Zoning Act, effective January 1, 1994. The Act requires the State Geologist to establish "earthquake fault zones" along known active faults in the State. Cities and counties that include earthquake fault zones are required to regulate development projects within these zones.

The Seismic Hazard Mapping Act of 1990 was enacted, in part, to address seismic hazards not included in the Alquist-Priolo Act, including strong ground shaking, landslides, and liquefaction. Under this Act, the State Geologist is assigned the responsibility of identifying and mapping seismic hazards zones.

The State of California Geologic Survey, previously known as the Division of Mines and Geology, has also adopted seismic design provisions in Special Publication 117, Guidelines for Evaluating and Mitigating Seismic Hazards in California on March 13, 1997.

As the Project Site includes a closed landfill, regulations enforced by various state agencies regarding the operation of landfills are also relevant. The relevant state agencies are as follows:

- Regional Water Quality Control Board;
- Integrated Waste Management Board;

- Department of Toxic Substance Control Board;
- Air Resources Board; and
- South Coast Air Quality Management District.

In addition, the on-site closed landfill is also subject to regulations enforced by City and County agencies, including the County Department of Public Works and City Department of Building and Safety.

## (2) City Level

The City of Los Angeles adopted the 2007 California Building Code and a series of City of Los Angeles amendments, on January 1, 2008 as the City of Los Angeles Building Code, Volumes 1 and 2. Volume 2 of the Los Angeles City Building Code includes Seismic Design provisions for Foundations, Retaining Walls and Expansive and Compressible Soils, provisions for Site Work, Demolition, Construction, and provisions for Grading, Excavation and Fills.

Together, the provisions in Volumes 1 and 2 of the Los Angeles City Building Code address issues related to site grading, cut and fill slope design, soil expansion, geotechnical investigations before and during construction, slope stability, allowable bearing pressures and settlement below footings, effects of adjacent slopes on foundations, retaining walls, basement walls, shoring of adjacent properties, and potential primary and secondary seismic effects.

The City of Los Angeles, Grading Division of the Department of Building and Safety, has also adopted their Rules of General Application, a series of Geotechnical Standards that supplement the requirements of the Los Angeles City Building Code. The Rules of General Applications include specific requirements for seismic design, slope stability, grading, foundation design, geologic investigations and reports, soil and rock testing, and groundwater. The City's Department of Building and Safety is responsible for implementing the provisions of the City's Building Code and Grading Standards.

The City's primary seismic regulatory document is the Safety Element of the City of Los Angeles General Plan, adopted November 26, 1996. The City's regulations incorporate the State's requirements. The objective of the Safety Element is to better protect occupants and equipment during various types and degrees of seismic events. In the City's Safety Element, specific guidelines are included for the evaluation of liquefaction, tsunamis, seiches, non-structural elements, fault rupture zones, and engineering investigation reports. The City's Emergency Operations Organization helps to administer certain policies and provisions of the Safety Element. The Emergency Operations

Organization is a City department comprised of all City agencies. The Administrative Code, Emergency Operations Organization Master Plan and associated Emergency Operations Organization plans establish the chain of command, protocols and programs for integrating all of the City's emergency operations into one unified operation. Each City agency in turn has operational protocols, as well as plans and programs, to implement Emergency Operations Organization protocols and programs. A particular emergency or mitigation triggers a particular set of protocols that are addressed by implementing plans and programs. The City's emergency operations program encompasses all of these protocols, plans and programs. The Safety Element goals, objectives, and policies are broadly stated to reflect the comprehensive scope of the Emergency Operations Organization.

### (3) County Level

The County of Los Angeles adopted the 2007 California Building Code on January 1, 2008 as the County of Los Angeles Building Code, Volumes 1 and 2.

Together, the provisions in Volumes 1 and 2 of the Los Angeles County Building Code address issues related to site grading, cut and fill slope design, soil expansion, geotechnical investigations before and during construction, slope stability, allowable bearing pressures and settlement below footings, effects of adjacent slopes on foundations, retaining walls, basement walls, shoring of adjacent properties, potential primary and secondary seismic effects. The County Department of Building and Safety is responsible for implementing the provisions of the Building Code. The County's primary seismic regulatory document is the Safety Element of the County of Los Angeles General Plan, dated December 1990.

### (4) Variation in Building Codes

Although both the City of Los Angeles and the County of Los Angeles building codes are based on the 2007 California Building Code, differences exist between the codes. Some of the major differences are summarized in Table 82 on page 1305.

## **b. Regional Geologic Setting**

The Project Site is located in the southern San Fernando Valley, within the Cahuenga Pass area at the foothills of the Santa Monica Mountains. The San Fernando Valley is an alluvium-filled basin, approximately 12 miles wide and 23 miles long. The alluvium is derived predominantly from bedrock materials comprising the Santa Monica Mountains to the south, the Santa Susana Mountains to the north, the Simi Hills to the west, the San Gabriel Mountains to the northeast, and the Verdugo Mountains to the east. Regionally, the Project Site is located in the Transverse Ranges geomorphic province.

**Table 82  
Comparison of Building Codes**

<b>Geotechnical Issue</b>	<b>City of Los Angeles Code 2008</b>	<b>County of Los Angeles Code 2008</b>
Compaction	Where cohesionless soil has less than 15% finer than 0.005 millimeters, the fill shall be compacted to at least 95%; if the soils have more than 15% finer than 0.005 millimeters the fill shall be compacted to at least 90%.	All fill shall be compacted to a minimum of 90%.
Wall Drainage	Basement wall drains are required unless the walls are designed to resist hydrostatic pressures.	Basement wall drains are not required in well-drained soils.
Pile Foundation Interconnection	Interconnection required to resist 10% of vertical load.	No requirement.
Benching	An 8-foot wide interceptor terrace is required on all cut or fill slopes at 25-foot vertical intervals and a 30-foot wide terrace is required at the midpoint on all cut and fill slopes more than 100 feet in height.	An 8-foot wide drainage terrace is required on all cut or fill slopes at 25-foot vertical intervals and a 20-foot wide terrace is required at the midpoint on all cut and fill slopes more than 100 feet in height.
Setbacks	A building setback at the toe of slopes equal to one-half the slope height is required. The maximum setback required is 15 feet. The horizontal distance between the face of the slope at the top of the slope and the base of the building foundation is required to be one-third the slope height, but not more than 40 feet.	A building setback at the toe of slopes equal to one-half the slope height is required. The maximum setback required is 20 feet.
<hr/> <p><i>Source: Shannon &amp; Wilson, Inc., 2010.</i></p>		

This province is characterized by east-west trending geologic structure including the nearby Santa Monica Mountains and the east-west trending San Fernando, Santa Susana, Simi, Santa Monica and Hollywood faults.

### **c. Site Topographic Characteristics**

The Project Site can be divided into three topographic areas; the relatively flat lower lot (north and northwest portions of the site); the upper graded plateau (central and south portions of the site); and the eastern hills that extend along the east side of the Project Site. The Los Angeles River, also referred to as the Los Angeles River Flood Control Channel in this area, borders the Project Site on the north and was channelized in the late 1940s. Prior to this, the river had incised meander swings that cut across the northern edge of the Project Site.



The lower lot is relatively flat at an approximate elevation of 525 to 580 feet above mean sea level, with a gentle surface gradient to the north. The lower lot contains sound stages, office space, technical/support space, back-lot sets, transportation services, and parking.

The upper graded plateau ranges in elevation from about 720 to 790 feet mean sea level, with the highest point near the eastern portion of the plateau. The upper graded plateau has gentle surface gradients to the north, west and south. Prior to grading and development, the upper graded plateau consisted of east-west trending hills with north-south trending ancestral canyons. The bulk of grading activities on the upper graded plateau occurred between 1960 and the early 1980s consisting of lowering the hills and filling in the canyons until a relatively level topography was achieved. The upper graded plateau contains the existing Entertainment Area (including Universal CityWalk and the Amphitheater) and office space.

The eastern hills of the Mixed-Use Residential Area are moderately to steeply sloping hillsides ranging in elevation up to 865 feet mean sea level. These hills have been partially graded in the past and fire roads have been constructed along the southeasterly site limits.

Additionally, several man-made water features exist on-site. Falls Lake is located on the eastern portion of the upper graded plateau. A shallow dam located along the northern edge of the lake retains water in Falls Lake. Jaws Lake is located north of Falls Lake on the lower lot at the base of the north-facing slope. Park Lake is also located on the lower lot north of Jaws Lake. The Collapsing Bridge pond is located south of Park Lake.

#### **d. On-Site Geology**

The Project Site is underlain by a variety of geologic units. These units are divided into separate and discrete deposits of differing engineering characteristics that include a closed landfill, engineered and non-engineered fill, alluvium, colluvium, landslide debris, and sedimentary bedrock materials.<sup>107</sup> These units are variable in composition and origin and are described in more detail below.

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<sup>107</sup> *Engineered Fill, for the purpose of this analysis is defined as fill placed with compactive effort under the direction of a licensed engineer with existing geotechnical documentation. Non-Engineered Fill for the purpose of this analysis is defined as fill without existing geotechnical documentation. Alluvium refers to sedimentary material deposited by flowing water, as in a riverbed or delta. Colluvium refers to loose and incoherent deposits, usually at the foot of a slope or cliff and brought there chiefly by gravity. Talus and cliff debris are included in such deposits. Bedrock refers to solid rock underlying all soil, sand, clay, gravel, and loose material on the earth's surface.*

### (1) Closed Landfill

The largest of the ancestral canyons on-site bisects the site from the existing Universal Hollywood Drive northward through the closed landfill (refer to Figure 176 on page 1308). The closed landfill, located in the center of the Project Site just east and north of the Amphitheater structure, was reportedly filled with debris generated during studio activities between the late 1920s (prior to the state's permitting and closing requirements) until about 1980. This debris, consisting of an undocumented mix of inert material, mainly construction debris, and restaurant waste, was placed in the north-south trending ancestral canyon to a maximum depth of approximately 130 feet. The closed landfill has been capped, and the face of the slope has been maintained for erosion prevention.

### (2) Fills (Engineered and Non-Engineered)

Fills have been placed throughout the lower lot, within the upper graded plateau, and within the eastern hills of the Project Site during past grading operations. Some areas of fill have been engineered, tested, and documented (refer to Figure 176 on page 1308). Other areas of fill are non-engineered and were placed without any special compactive effort or geotechnical documentation such as the area along the northern edge of the property. Fill soils may exist at other locations at the site and may be deeper than encountered during field explorations. Fill materials vary from silty sand to sandy silt with clay.

### (3) Alluvium/Colluvium Soil

Alluvial soils (alluvium) are natural, fluvial sedimentary deposits typically confined to stream channels, flood plains or alluvial fans. Colluvium (slope wash) is the down-slope accumulation of topsoil, weathered bedrock and other organic materials under the influence of gravity and moisture. These two units often coalesce and are sometimes difficult to separate near their juncture. These deposits are Quaternary age (Pleistocene and Holocene) and usually overlie bedrock and landslide debris. Alluvium has been deposited generally in the lowermost portions of the site near Lankershim Boulevard and along the Los Angeles River Flood Control Channel. Relatively minor deposits have been mapped in the extreme southeasterly portion of the site along Barham Boulevard near the intersection with the Hollywood Freeway. Alluvial soils consist generally of silty clay, silty sand with interlayered clay, and sand.

### (4) Landslide Deposits

Features indicative of landsliding were noted at four separate locations designated QIsA, QIsB, QIsC, and QIsD (refer to Figure 176 on page 1308). Two of these landslides, QIsA and QIsB, occupy portions of the Mixed-Use Residential Area on the ridge. These two landslides were initially recognized through review of aerial photographs as distinct, geomorphic anomalies and were encountered during field explorations.



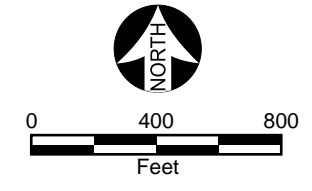
**EXPLANATION**

**GEOLOGIC UNITS**

- ef ENGINEERED FILL
- nef NON-ENGINEERED FILL
- Qal ALLUVIUM
- col COLLUVIUM
- Qls LANDSLIDE DEBRIS
- Tt TOPANCA FORMATION  
Interbedded sandstone, siltstone and shale
- CLOSED LANDFILL

**GEOLOGIC UNITS**

- GEOLOGIC CONTACT DASHED WHERE APPROXIMATELY LOCATED, DOTTED WHERE BURIED
- - - BENEDICT CANYON FAULT (after Dibblee, 1991)  
Dashed where approximate, dotted where inferred
- APPROXIMATE LIMITS OF LANDSLIDE DEBRIS
- APPROXIMATE LOCATION AND PLUNGE OF SYNCLINAL FOLD AXIS
- REPORTED LIMITS OF EXISTING BUTTRESS FILL
- CREEP AFFECTED SLOPE



Source: Shannon & Wilson, Inc., 2010.



**Figure 176**  
Geotechnical Map

*(a) QIsA*

This landslide deposit is located beneath Warehouse #8413 and occupies an area of approximately nine acres. Based upon observations from geologic downhole logging, the landslide is buried by four feet of fill and was observed to consist of very highly weathered sandstone and soft, brecciated shale. The basal landslide rupture surface was observed to be a 4-inch thick very moist, clay gouge layer in contact with competent, hard bedrock materials.

An additional, small diameter boring was drilled within the QIsA limits with a hollow stem auger drill rig and may have encountered landslide debris buried by fill materials. It is also possible that grading in this area removed the landslide debris prior to placing compacted fill. The small diameter boring did not allow for direct observation by a geologist and the presence or absence of the landslide could not be confirmed at this location.

*(b) QIsB*

This landslide occupies approximately one and a quarter acres and was recognized northeast of QIsA, upslope of the European Village and beneath Colonial Drive. A bucket auger boring drilled within the QIsB limits encountered landslide debris to a depth of 21 feet, underlain by hard competent bedrock materials. The basal rupture surface was observed to consist of a 1-inch thick clay gouge layer.

*(c) QIsC*

A third possible landslide, QIsC, is located within the adjoining residential development just offsite at the southeast corner of the Project Site. This landslide occupies an area of about half an acre and was recognized in the field and on aerial photographs. This landslide was not explored and is therefore designated a possible landslide that may underlie fill materials within the Project Site.

*(d) QIsD*

This relatively large landslide feature is located in the north central portion of the Project Site. This landslide occupies an area of about 15 acres just east and north of the closed landfill and south and uphill of the alluvial floor. Past grading activities have extensively modified the landslide's original (pre-grading) condition over the years. This area of the Project Site is currently used as a warehouse-maintenance facility. Although the landslide was mapped by other investigations, it was not explored during recent field investigations. Therefore, its exact limits and dimensions was not reported in the Report of Geotechnical Investigation NBC Universal Evolution Plan. At this time, QIsD is considered a possible landslide and would require exploration during site-specific geotechnical

investigations and may require mitigation should development occur within the areas designated QIsD.

### (5) Slope Stability

Portions of the Project Site are located within the City of Los Angeles designated Hillside Grading Area. The Project Site is also located within areas designated by the state geologist where previous occurrences of landslide movement or local topographic, geological, geotechnical, and subsurface water conditions indicate a potential for permanent ground displacement to the extent that mitigation would be required. The bedrock consists of well-bedded Topanga Formation sandstone, siltstone, and shale. Bedding within the Topanga Formation is well-defined and dips generally to the north, northwest, and northeast. Where the bedding is oriented toward the slope face, the slopes are subject to landsliding.

Buttress fills, apparently placed to stabilize west-facing cut slopes during previous grading in the area of the QIsA landslide, are reported within the east central portion of the Project Site (refer to Figure 176 on page 1308). A slope stability hazard exists in the vicinity of the existing landslides and anywhere the bedding could be exposed, particularly the north and west-facing slopes (refer to Figure 177 on page 1311).

### (6) Bedrock

Sedimentary bedrock units of the Topanga Formation consisting of well-bedded sandstone, siltstone, and shale underlie the entire Project Site. These deposits are marine in origin derived from offshore shoal, turbidite, and submarine fan deposits. The bedrock generally ranges from moderately hard to moderately soft, but is locally very hard and well cemented in layers as thick as six feet. Surface exposures are typically friable and moderately weathered. Gouged and sheared clay beds were observed along bedding between well-cemented sandstone layers. Volcanic dikes in the region intrude the Topanga Formation locally. Explorations and observations at the Project Site did not encounter volcanic rock units but these units may be encountered during future grading operations.

## e. Geologic Structure

Faulting and folding related to uplift in this portion of the Santa Monica Mountains have warped the geologic structure into a broad, westerly plunging syncline. Due to the broad nature of the synclinal fold, the exact location of the fold axis could not be accurately determined but the approximate location and orientation of the fold axis is depicted on Figure 176 on page 1308.



**EXPLANATION**

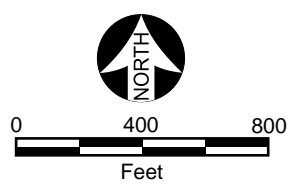
- GEOLOGIC UNITS**
- ef ENGINEERED FILL
  - nef NON-ENGINEERED FILL
  - Qal ALLUVIUM
  - col COLLUVIUM
  - Qls LANDSLIDE DEBRIS
  - Tt TOPANGA FORMATION  
Interbedded sandstone, siltstone and shale
  - [Symbol] CLOSED LANDFILL

- GEOLOGIC UNITS**
- GEOLOGIC CONTACT DASHED WHERE APPROXIMATELY LOCATED, DOTTED WHERE BURIED
  - BENEDICT CANYON FAULT (after Dibblee, 1991)  
Dashed where approximate, dotted where inferred
  - [Symbol] APPROXIMATE LIMITS OF LANDSLIDE DEBRIS
  - [Symbol] APPROXIMATE LOCATION AND PLUNGE OF SYNCLINAL FOLD AXIS

- [Symbol] REPORTED LIMITS OF EXISTING BUTTRESS FILL
- [Symbol] CREEP AFFECTED SLOPE

- GEO TECHNICAL HAZARDS**
- [Symbol] POTENTIAL SLOPE STABILITY HAZARD
  - [Symbol] LIQUEFACTION POTENTIAL ZONES  
HIGH  
MODERATE  
LOW
  - [Symbol] NON-ENGINEERED FILL REMOVALS

N 160500  
N 160000  
500



Source: Shannon & Wilson, Inc., 2010.



**Figure 177**  
Geotechnical Hazards Map

Inactive faults and shears (minor faults) were observed in bucket auger borings and in surface exposures during field explorations at the Project Site. These faults are late Miocene and Pliocene Age and are the result of local seismic activity associated with uplift of the Santa Monica Mountains. These fault features are common in the Topanga Formation and are exhibited by offset bedding and folded bedding planes. The faults and shears appear to be randomly oriented and are generally considered discontinuous and do not display a preferred orientation. Evidence of recent activity was not observed during site reconnaissance or a review of aerial photographs. Previous reports do not indicate active faults at the Project Site.

Fractures and joints are also common within the Topanga Formation. These joints were observed to be widely spaced, tight and stained with iron and manganese oxides and infilled, locally, with carbonates and gypsum.

## **f. Groundwater Basin**

Groundwater storage is generally within the deep alluvial deposits that fill the valley floor under confined and unconfined conditions. Groundwater in the Studio Area has been measured to depths between 20 and 40 feet below the ground surface. Historically, the highest groundwater levels on the Project Site have been within 10 feet of the ground surface adjacent to the Los Angeles River Flood Control Channel on the north side of the Project Site. These high water levels existed prior to the channelization of the Los Angeles River Flood Control Channel. Because of the channelization of the river and the control of surface runoff, the groundwater is not expected to rise above depths of approximately 15 feet below ground surface.

Borings drilled within the bedrock in the upper graded plateau and within the eastern hills encountered water seepage at various depths. This water seepage is a result of surface infiltration perched within joints and fissures in the bedrock. During grading, temporary excavations and cut slopes may reveal occurrences of groundwater seepage in the natural soils or the bedrock requiring construction dewatering.

## **g. Faulting and Seismicity**

The numerous faults in southern California include active, potentially active, and inactive faults. Classification for these major groups is based upon criteria developed by the California Division of Mines and Geology (now known as the California Geologic Survey) for the Alquist-Priolo Zone Act program.

There are no known active faults present through the Project Site, and the site is not located within a currently established Alquist-Priolo Earthquake Fault Zone for surface rupture hazard or City of Los Angeles Fault Rupture Study Area. The closest Alquist-Priolo

Zone to the Project Site is approximately 5 miles to the northeast. This zone is associated with the Verdugo fault.

Surface traces of the regionally extensive Benedict Canyon fault have been mapped through the westerly portion of the Project Site in the Studio Area. This fault is not considered active or potentially active according to the State Geologist but influences geologic structure regionally and juxtaposes bedrock units along the fault trace. The mapped surface traces of the Benedict Canyon fault are plotted on Figure 176 on page 1308.

Because there are no known active faults on the Project Site, the potential for surface rupture from fault plane displacement propagating to the surface is considered remote.

The closest active fault to the Project Site is the Hollywood fault located approximately one and a half miles to the southeast at the southern base of the Santa Monica Mountains. Additionally, the Elysian Park Fold and Thrust Belt fault is located approximately one and a half miles to the southeast. The Elysian Park fault is a blind fault (i.e., buried fault that does not extend to the surface) capped by a fold and thrust structure. The subsurface faults that create the structure are not exposed at the surface and do not present a potential surface rupture hazard; however, as demonstrated by the 1987 earthquake and two smaller earthquakes on June 12, 1989, the faults are a source for future seismic activity. As such, the Elysian Park Fold and Thrust Belt should be considered an active feature capable of generating future earthquakes.

A list of known active faults in the Project Site's vicinity and their distances from the Project Site are indicated in Table 83 on page 1314 and a list of known potentially active faults in the Project Site's vicinity and their distances from the Project Site are indicated Table 84 on page 1314. Evidence of the fault's potential activity is based on the fault's rupturing materials younger than approximately 11,000 years and historic records are limited to a few hundred years. Therefore, major earthquakes have not been recorded within historic time on all of the faults considered to be active in southern California. No information is available to predict or provide odds of earthquake occurrence.

Several earthquakes of moderate to large magnitude (greater than 5.3) have occurred in the southern California area within the last 60 years. A list of these earthquakes is included in Table 85 on page 1315. These epicenters are plotted relative to the Project Site on Figure 178 on page 1316.



**Table 83  
Major Active Faults**

<b>Fault</b>	<b>Maximum Credible Earthquake</b>	<b>Fault Type</b>	<b>Slip Rate (mm/yr)</b>	<b>Distance From Site (miles)</b>	<b>Direction From Site</b>
Hollywood	7.0	RO	1.5	1½	SSE
Elysian Park Fold and Thrust Belt	7.1	RO	1.7	1½	SE
Santa Monica Mountains	7.2	RO	4.0	2	S
Verdugo	6.75	RO	0.5	5	NE
Northridge	6.9	RO	1.5	>5	NW
Newport-Inglewood Zone	7.0	SS	1.0	7	S
Raymond	6.7	RO	0.4	9	E
San Fernando	6.8	RO	5.0	9	N
Sierra Madre	7.3	RO	4.0	9	NE
Oak Ridge – Pico Thrust	6.7	RO	4.0	17	NW
Whittier	7.1	SS	3.0	18	SE
San Andreas (Mojave Segment)	8.2	SS	30.0	30	NE

*Notes: SS = Strike Slip; RO = Reverse Oblique*

*Source: Shannon & Wilson, Inc., 2010.*

**Table 84  
Major Potentially Active Faults**

<b>Fault</b>	<b>Maximum Credible Earthquake</b>	<b>Fault Type</b>	<b>Slip Rate (mm/yr)</b>	<b>Distance From Site (miles)</b>	<b>Direction From Site</b>
San Jose	6.7	RO	0.5	28	ESE
Chino	7.0	NO	1.0	36	SE
Duarte	6.7	RO	0.1	30	NE
Rialto-Colton	6.4	SS	n/d	54	E
Norwalk	6.7	RO	0.1	22	SE
Coyote Pass	6.7	RO	0.1	12	SE
Los Alamitos	6.2	SS	0.1	24	SE
MacArthur Park	6.1	SS	0.1	6	SW
Overland	6.0	SS	0.1	12	SW
Charnock	6.5	SS	0.1	10	SW
Santa Susana	6.9	RO	6.2	14	NW

*Notes: SS = Strike Slip; NO = Normal Oblique; RO = Reverse Oblique; n/d = not determined*

*Source: Shannon & Wilson, Inc., 2010.*

**Table 85**  
**List of Major Historic Earthquakes**

<b>Earthquake</b>	<b>Date of Earthquake</b>	<b>Magnitude</b>	<b>Distance to Epicenter (miles)</b>	<b>Direction to Epicenter</b>
Long Beach	March 11, 1933	6.4	43	SSE
San Fernando	February 9, 1971	6.6	19	NW
Whittier Narrows	October 1, 1987	5.9	16	SE
Sierra Madre	June 28, 1991	5.4	20	E
Big Bear	June 28, 1992	6.4	86	E
Landers	June 28, 1992	7.3	98	E
Northridge	January 17, 1994	6.7	12	W

*Source: Shannon & Wilson, Inc., 2010.*

## **h. Liquefaction**

Portions of the Project Site are located within areas designated by the state geologist where historic occurrence of liquefaction or local geologic, geotechnical, and groundwater conditions indicate a potential for permanent ground displacement. Liquefaction potential is greatest where the groundwater level is shallow, and loose sands or silts occur within a depth of about 50 feet or less. In general, liquefaction potential decreases as grain size and clay and gravel content increase. As ground acceleration and shaking duration increase during an earthquake, liquefaction potential increases.

The north side of the Project Site adjacent to the Los Angeles River Flood Control Channel is underlain by loose to medium dense granular soils with groundwater potentially within 50 feet of grade. The soils in this area are susceptible to liquefaction. This potentially liquefiable zone varies from about 100 feet to over 800 feet south of the river and is within the non-engineered fill (nef) and the recent alluvium (Qal) adjacent to the Los Angeles River Flood Control Channel (refer to Figure 177 on page 1311).

The potential for seismic settlement resulting from liquefaction is estimated to vary from less than one inch to greater than one foot. The greatest amount of settlement would be expected to occur immediately adjacent to the Los Angeles River Flood Control Channel and would decrease to the south. Areas of liquefaction potential have been identified as shown in Figure 177 on page 1311.

The establishment of the levels of identified hazard potentials is based on a review of previous exploration data, findings, and conclusions (which are listed in the reference section of the geotechnical report). Some variations should be anticipated in the limits of these zones. Site specific geotechnical investigations, including detailed liquefaction



Source: Shannon & Wilson, Inc., 2010.

studies, would be required for each project, as that term is defined in the proposed City and County Specific Plans, in accordance with the applicable jurisdiction's standards, if said project is within the areas with liquefaction potential as identified in Figure 177 on page 1311. These requirements are expressed as mitigation measures presented later in this section.

### 3. Environmental Impacts

#### a. Methodology

To evaluate potential hazards relative to geology and soils, a Geotechnical Investigation (Geotechnical Report) was prepared by Van Beveren & Butelo, Inc. The Geotechnical Report included field exploration (i.e., exploratory soil borings) and laboratory testing to determine the characteristics of the subsurface conditions at the Project Site. In addition, relevant literature and materials were reviewed as part of the Geotechnical Report. For a more detailed description of this Geotechnical Report and its findings, please refer to Appendix H, *Geotechnical Investigation NBC Universal Evolution Plan*, of this Draft EIR.

#### b. Thresholds of Significance

The *City of Los Angeles CEQA Thresholds Guide (2006)* requires the geotechnical analysis to address the following four areas of study: (1) geologic hazards; (2) sedimentation and erosion; (3) landform alteration; and (4) mineral resources. The first three areas of study are addressed in this section, while the fourth, mineral resources, is addressed in the Project's Initial Study (see Appendix C to this Draft EIR). Based on the criteria set forth in the *City of Los Angeles CEQA Thresholds Guide (2006)*, the proposed Project would have a significant impact under the following criteria:

##### (1) Geologic Hazards

- The Project causes or accelerates geologic hazards which would result in substantial damage to structures or infrastructure, or expose people to substantial risk of injury.

##### (2) Sedimentation and Erosion

- The Project causes or accelerates instability from erosion so as to result in a geologic hazard to other properties; or
- The Project accelerates the natural processes of wind and water erosion and sedimentation, resulting in sediment runoff or deposition which would not be contained or controlled on-site.

### (3) Landform Alteration

- One or more distinct and prominent geologic or topographic features would be destroyed, permanently covered or materially and adversely modified (e.g., hill slopes, etc.).

## c. Project Design Features

Project construction would occur in accordance with the following Project design features:

- All Project construction would conform to the requirements of the applicable building code, including all provisions related to seismic safety.
- As part of Project grading, erosion and sedimentation control measures would be implemented during site grading to reduce erosion impacts. The Applicant or its successor would also comply with all construction site runoff control and implement construction "Best Management Practices" under applicable state and local requirements, as discussed further in Section IV.G.1.b, Water Resources – Surface Water Quality of this Draft EIR.
- Dewatering activities would be conducted in accordance with the applicable permit requirements, as discussed further in Section IV.G.1.b, Water Resources – Surface Water Quality of this Draft EIR.

## d. Project Impacts

### (1) Construction and Operation

Due to the nature of potential geotechnical hazards, impacts could occur during the construction phase and/or during operations. Thus, the following discussion is organized according to specific geotechnical hazards under separate subheadings. Each subsection addresses the possible construction and/or operations impacts of the Project as appropriate.

#### *(a) Geologic Hazards*

##### *(i) Fault Rupture*

As noted, the Project Site is not located within either an Earthquake Fault Zone or an Alquist-Priolo Hazard Zone and the potential for fault rupture is considered to be low. Therefore, Project impacts related to fault rupture would be less than significant and no mitigation measures are required.

*(ii) Strong Seismic Ground Shaking*

The Project Site is not exposed to a greater than normal seismic risk than other areas of southern California. Based on the active and potentially active faults in the region, the Project Site could be subjected to significant ground shaking in the event of an earthquake. However, the Project Applicant would be required to design and construct the Project in conformance to the most recently adopted building code design parameters. The structures located in the upper plateau portion of the Project Site (i.e., within the Entertainment Area) may be assumed to be Site Class C (Very Dense Soil and Soft Rock Profile) and would be designed to resist earthquake forces in accordance with the 2008 Los Angeles City or Los Angeles County Building Codes. The structures located in the lower plateau portion of the Project Site may be assumed to be Site Class E (Soft Soil Profile) and would be designed to resist earthquake forces in accordance with the 2008 Los Angeles City or Los Angeles County Building Codes. The mapped maximum considered earthquake spectral response accelerations,  $S_s$  and  $S_1$ , are 1.515 and 0.600, respectively, according to the 2008 Los Angeles County Building Code. The site coefficients,  $F_a$  and  $F_v$ , would be determined for these spectral response acceleration values and for a Site Class C or E, accordingly. Current building code design parameters are shown in Table 86 on page 1320.

Conformance with the applicable building code requirements would reduce the potential for structures on the Project Site to sustain damage during an earthquake event, and Project impacts related to ground shaking would be less than significant and no mitigation measures are required.

*(iii) Liquefaction*

Based on anticipated site conditions, the potential for liquefaction to occur on the site ranges from high to low. The potential for ground failures associated with liquefaction (i.e., lateral spreading, post-liquefaction reconsolidation, and sand boils) would correspond with the liquefaction potential designation on-site. Liquefaction potential on-site is most prevalent within the natural alluvial deposits in the lower lot along the Los Angeles River Flood Control Channel. Additionally, during grading, temporary excavations and cut slopes in the natural soils or the bedrock may reveal unanticipated occurrences of groundwater seepage that could increase the potential for liquefaction. Impacts would be considered significant for areas designated with a high or moderate potential for liquefaction. Mitigation is proposed to reduce this impact to a less than significant level including the completion of site-specific liquefaction hazard studies.

**Table 86**  
**Seismic Design Parameters**

Seismic Parameter	Recommended Value
Soil Class Type	C, E
Spectral Response Accelerations $S_s$	1.515
Spectral Response Accelerations $S_1$	0.600

*Source: Shannon & Wilson, Inc., 2010.*

*(iv) Groundwater Seepage*

During grading, temporary excavations and cut slopes in the natural soils or the bedrock may reveal unanticipated occurrences of groundwater seepage. This could require dewatering during Project construction, which, per the identified Project design feature, would occur in accordance with all applicable permit requirements. Please refer to Section IV.G.2, Groundwater, for additional analysis regarding the potential for dewatering during Project construction.

*(v) Landslides*

A slope stability hazard is present for most west, northeast, and north-facing cut slopes. The natural slopes at the north-eastern portion of the Project Site, where the Project Site is adjacent to Barham Boulevard, are stable from deep-seated failures, but these slopes are steep with inclinations as steep as ½:1, up to about 50 feet in height, and are subject to rockfall hazards. Therefore, Project impacts related to landslides would be significant and mitigation is proposed to reduce this impact to a less than significant level, which could include but not be limited to, the construction of a four foot high slough wall and a three foot rockfall catchment fence on top of the slough wall to attain a minimum height of seven feet from the adjacent grade at the base of the slope adjacent to Barham Boulevard or rock netting placed over the face of the slope alone or in conjunction with the slough wall and catchment fence.

*(vi) Closed Landfill*

Methane gases are generated by the decomposition of organic matter and methane gas may be present in the closed landfill. The methane may also migrate beyond the limits of the closed landfill. Refer to Section IV.M, Environmental Safety, of this Draft EIR for additional discussion of methane hazards and mitigation.

Similar to other non-engineered fills, the closed landfill is subject to settlement, made greater by the depth of the fill and the existence of decomposable organic matter.

Impacts resulting from potential future development in this area would be considered significant. Mitigation is proposed to reduce this impact to a less than significant level.

*(vii) Flooding and Inundation*

The Project Site is not located in a County or City of Los Angeles flood or inundation hazard zone and is not mapped on flood rate insurance maps. The Los Angeles River Flood Control Channel borders the northerly site limits which has been contained and concrete lined and is not considered a flood hazard with respect to the Project Site. The Project Site is not located in close proximity to large bodies of water and the potential adverse effects of seiching are unlikely. Therefore, Project impacts related to flooding and inundation would be less than significant.

*(viii) Geologic and Soil Instabilities*

Impacts related to landslides, lateral spreading, and liquefaction are described above. The Project Site is not located within an area of known subsidence (ground settlement) associated with fluid withdrawal (groundwater or petroleum), peat oxidation, or hydrocompaction. Historically, the highest groundwater levels have been within 10 feet of the ground surface prior to channelization of the Los Angeles River. After channelization, the historic high groundwater level is expected to be approximately 15 feet below ground surface. Groundwater could be encountered within excavations that extend more than about 15 feet below ground surface and would require dewatering.

If dewatering is required during construction, dewatering is not anticipated to lower groundwater across any substantial distance and any related settlement is expected to be minimal and localized within the area of construction. The settlement would occur quickly and be completed shortly after completion of the excavation. Any potential settlement related to long-term dewatering for building operation would be less than, and already accounted for in, the construction dewatering settlement. Recommendations for the efficient design of any required dewatering systems shall be included in the site-specific geotechnical investigations and recommendations for new construction. Therefore, Project impacts related to geologic and soil instabilities would be less than significant.

*(ix) Expansive Soils*

Sandstone bedrock units are considered non-expansive. Expansion Index tests on samples of siltstone and shale units from the Mixed-Use Residential Area investigation varied, from 12 to 54, indicating that the siltstone and shale bedrock units vary from non-expansive to a medium expansion potential. The alluvium, colluvium, and fill soils have Expansion Index values up to about 60, which is a medium expansion potential.



The expansive soils could result in vertical movement of lightly loaded slabs on grade. Because these soils are relatively impermeable, irrigation water could become trapped within the upper soils of landscaped areas particularly if the landscaped areas are covered with permeable planting materials. This trapped water could move laterally beneath slabs, curbs, and paving. Impacts would be considered significant. Mitigation is proposed to reduce this impact to a less than significant level.

*(x) Fills (Engineered and Non-Engineered)*

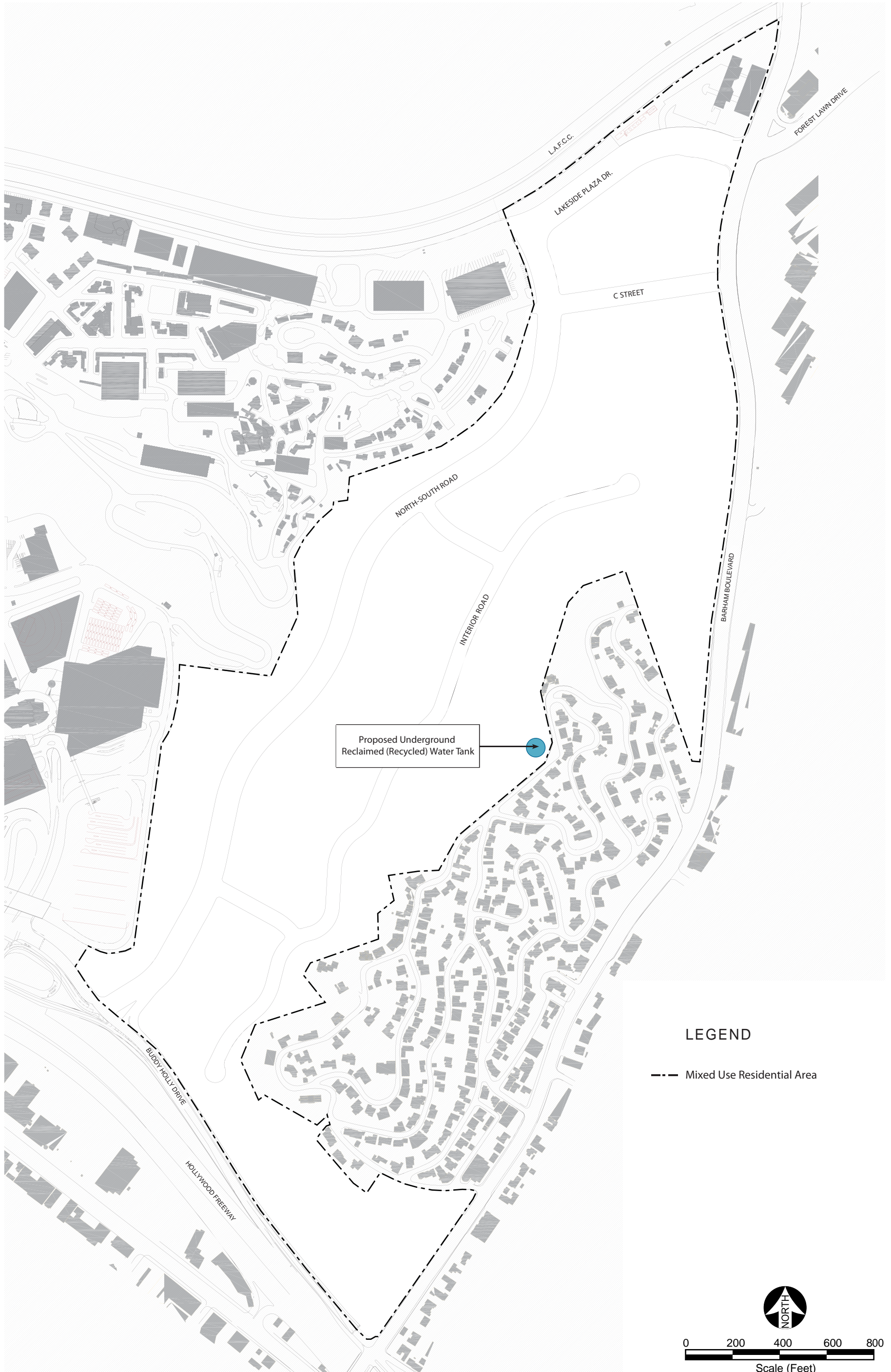
The non-engineered fills that are present on the Project Site may be weak and compressible, particularly with the addition of water. Cut slopes in these fills are subject to sloughing and failure because of their low shear strength. These fills are not suitable for support of new fills, foundations, concrete slabs on grade, or paving. Impacts would be considered significant for areas designated with non-engineered fills. As stated in Mitigation Measures F-13 through F-15 below, non-engineered fills that are present shall be excavated and replaced as compacted fill properly benched into suitable materials in accordance with the City or Los Angeles County Code requirements. Additionally, surface water runoff shall be removed by subdrains from basement and/or retaining walls. Further, any vegetative swales shall be constructed in accordance with the City or County of Los Angeles Code requirements. Adherence to these mitigation measures would reduce impacts related to non-engineered fills that are present to a less than significant level.

*(xi) Reclaimed (Recycled) Water Tanks*

The Project proposes construction of a subterranean reclaimed water tank to serve the Mixed-Use Residential Area as discussed below. Additionally, other subterranean reclaimed water tanks may be located in the Studio, Entertainment, or Business Areas. These additional tanks in the Studio, Entertainment and Business Areas would be 50,000 gallons or less in size and would be installed pursuant to regulatory requirements.

For purposes of the geotechnical analysis, a reclaimed water tank as large as 120 feet in diameter and 10 feet deep with up to a 850,000 gallon capacity constructed of reinforced concrete or steel was analyzed. The proposed tank would be located on the east side of the Project Site at the top of a 150-foot high graded slope. The location of the proposed reclaimed water tank is shown in Figure 179 on page 1323. If constructed at this location, the tank would be buried, with the top of the tank exposed and the base set back about 30 feet from the face of the slope. Because the slope consists of non-engineered fill, placement of the water tank at this location could result in a potentially significant impact. Mitigation is proposed to ensure the proposed location is suitable for the tank and to reduce this impact to a less than significant level.

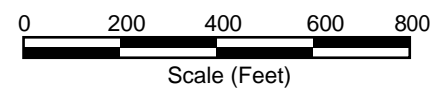
Additionally, as an alternative to having one tank to serve the Mixed-Use Residential Area, there could be the equivalent capacity in a series of smaller tanks ranging in size



Proposed Underground Reclaimed (Recycled) Water Tank

LEGEND

--- Mixed Use Residential Area



Source: Rios Clementi Hale Studios, 2010.

**Figure 179**  
Proposed Reclaimed (Recycled) Water Tank Location

from 25,000 to 250,000 gallons in capacity. These smaller tanks would be situated below ground in proposed Planning Subareas and/or open spaces in the Mixed-Use Residential Area of the Project Site. These alternative locations could potentially encounter other geologic hazards including liquefaction that could result in a potentially significant impact. Mitigation is proposed to reduce this impact to a less than significant level.

*(xii) Sedimentation and Erosion*

Implementation of the Project would require grading for the establishment of building sites, roads and to install on-site infrastructure, i.e., surface drainage. Typically, the grading of areas in preparation for development would follow a sequence of rough and finish grading phases. During rough grading, a base course for the road and development areas are cut and filled. During finish grading, development pads are finish graded prior to the construction of buildings. During this sequence of rough and finish grading phases, significant soil erosion impacts could occur.

If the Mixed-Use Residential Area is annexed to the City of Los Angeles, it is anticipated that it may be included within a City of Los Angeles designated Hillside Grading Area. The grading requirements as designated in the City or County building codes, as applicable, for drainage and planting of slopes would be followed. In addition, grading, excavation, and other earth-moving activities could potentially result in erosion and sedimentation. For any grading performed during the “rain season” (generally November to April) provisions would need to be made to control erosion, and an erosion control plan must be submitted to the appropriate building department. Thus, with the implementation of the Applicant’s proposed Project Design Feature, which requires compliance with all construction site runoff controls and implementation of construction “Best Management Practices” under applicable State and local requirements, Project impacts with regard to sedimentation and erosion would be less than significant. Refer to Section IV.G.1.b, Water Resources – Surface Water Quality, of this Draft EIR for additional discussion of erosion and sedimentation during construction and mitigation measures to reduce impacts.

*(b) Landform Alteration*

*(i) Grading*

The planned grading within the Mixed-Use Residential Area of the Project Site would excavate into an existing north-south trending ridge. The excavation would not, however, reduce the overall height of the ridge at its highest point. The grading also would not alter any significant canyons, ravines or outcrops. Therefore, no distinct and prominent geologic or topographic features would be adversely affected by the Project, and Project impacts related to landform alteration during grading would be less than significant.

*(ii) Cut and Fill*

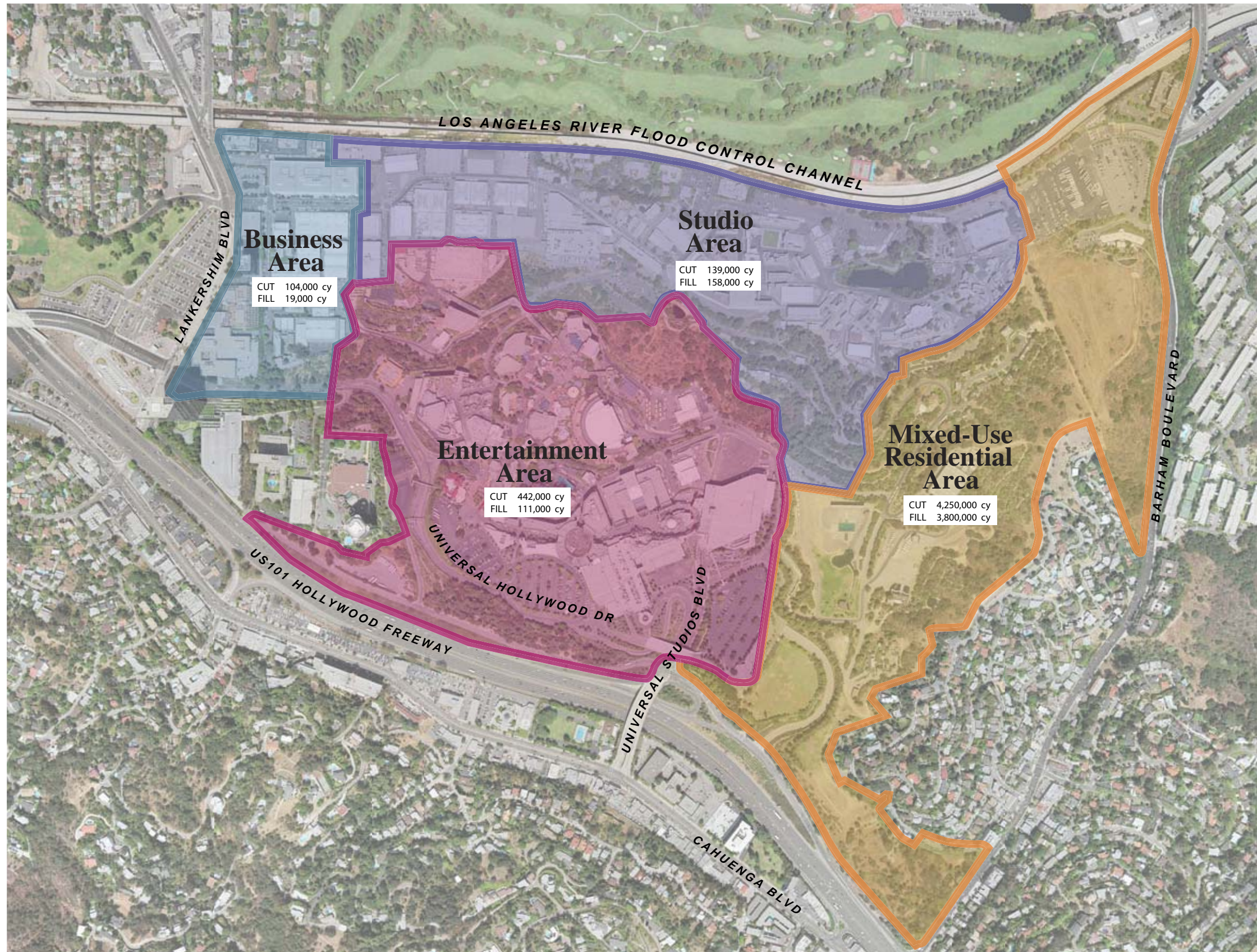
Grading for the Project Site would require both excavation and the placing of compacted fills. Project construction would require the export of excavated materials as well as some import of fill material. The reuse of soil on-site would be implemented to the extent possible in lieu of material export. The estimated quantities of earthwork are shown on Figure 180 on page 1326 and are summarized in Table 87 on page 1327.

The haul route for material exported from the Mixed-Use Residential Area would occur via Lakeside Plaza Drive to Forest Lawn Drive to State Route 134 (Ventura Freeway), which provides access to the regional freeway system. As an alternate to this route, haul vehicles exporting materials from the Mixed-Use Residential Area could also exit the Project Site via Buddy Holly Drive to Universal Studios Boulevard to the Hollywood Freeway (US-101). The haul route for material from the Studio, Business, and Entertainment Areas would access the regional freeway system either via Lankershim Boulevard or Universal Studios Boulevard to the US 101 freeway, or via Forest Lawn Drive to State Route 134.

Anticipated phasing of the Mixed-Use Residential Area would require stockpiling excavated soils for future use as compacted fill. With phased development, excavated material could be stockpiled on undeveloped portions of the Project Site.

If the stockpile will remain in place after completion of adjacent developments, the exterior slopes of the stockpile would be treated as permanent slopes with drainage requirements consistent with the requirements of the City of Los Angeles or the County of Los Angeles, as applicable. If the stockpiled fill would be in place for less than one year or if the stockpile is less than 40 feet in height, the fill would not need to be compacted and tested, but the stockpiled material would be placed in lifts not more than two feet in thickness and rolled with heavy compaction equipment. If the stockpiled fill is greater than 40 feet in height, the outer portion of the fill, with a width equal to at least the height of the fill, would be compacted to at least 90 percent. The interior core of the stockpile would not need to be compacted to the 90 percent minimum, but would at least be track-rolled with heavy equipment. Stockpile fill more than 40 feet in height would not be constructed steeper than a 2:1 slope inclination. In addition, drainage terraces would be provided on all slopes and the terraces would be at least 8 feet in width and spaced no further than 25 feet apart vertically.

If the stockpiled fill were to be in place for less than one year and if the stockpile were less than 40 feet in height, the normal City requirements for rainy weather erosion protection would be sufficient. This means that the stockpile would be surrounded by sandbags and all runoff would be collected into approved storm water collection devices.



Source: Rios Clementi Hale, 2010.



**Figure 180**  
Conceptual Grading Plan

**Table 87**  
**Summary of Cut and Fill Quantities**

Area	Cut (cubic yards)	Fill (cubic yards)
Studio Area	139,000	158,000
Entertainment Area	442,000	111,000
Business Center Area	104,000	19,000
Mixed-Use Residential Area	4,250,000	3,800,000
<b>Total</b>	<b>4,935,000</b>	<b>4,088,000</b>

*Source: Shannon & Wilson, Inc., 2010.*

The side slopes of the stockpile fill, less than 40 feet in height, may be constructed as steep as 1½:1 (horizontal to vertical).

The stockpile would be located in a manner such that it would not alter any significant canyons, ravines or outcrops, and no distinct and prominent geologic or topographic features would be adversely affected by the Project. Therefore, Project impacts related to landform alteration during grading would be less than significant.

## (2) Impacts Under the No Annexation Scenario

In the event that the proposed annexation/detachment does not occur, construction would comply with all applicable building codes of the County of Los Angeles for the County portions and City of Los Angeles building codes as applicable for the City portions of the Project Site. While there would be differences between code requirements, adherence to either code would mitigate all geologic impacts. As such, impacts with respect to geotechnical conditions associated with the No Annexation scenario would be less than significant.

## 4. Cumulative Impacts

Geotechnical impacts related to future development in the City and County of Los Angeles would involve hazards associated with site-specific soil conditions, erosion, and ground-shaking during earthquakes. The impacts on each site would be specific to that site and its users and would not be common or contribute to (or shared with, in an additive sense) the impacts on other sites. In addition, development on each site would be subject to uniform site development and construction standards that are designed to protect public safety. Therefore, cumulative geology and soil impacts would be less than significant and no mitigation measures are required.

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## 5. Project Design Features and Mitigation Measures

### a. Project Design Features

Project construction would occur in accordance with the following Project design features:

**Project Design Feature F-1:** All Project construction shall conform to the requirements of the applicable building code, including all provisions related to seismic safety.

**Project Design Feature F-2:** As part of Project grading, erosion and sedimentation control measures would be implemented during site grading to reduce erosion impacts. the Applicant or its successor shall also comply with all construction site runoff control and implement construction “Best Management Practices” under applicable state and local requirements, as discussed further in Section IV.G.1.b, Water Resources – Surface Water Quality of this Draft EIR.

**Project Design Feature F-3:** Dewatering activities shall be conducted in accordance with the applicable permit requirements, as discussed further in Section IV.G.1.b, Water Resources – Surface Water Quality of this Draft EIR.

### b. Mitigation Measures

#### (1) General

**Mitigation Measure F-1:** Prior to issuance of the building permit for a building or structure, a site-specific geotechnical report shall be prepared for each project, as that term is defined in the City and County Specific Plans, in accordance with the City or County of Los Angeles requirements to the satisfaction of the applicable jurisdiction. The recommendations contained within these site-specific geotechnical reports, including those pertaining to site preparation, fill placement, and compaction; foundations; pavement design; footings; and pile foundations shall be implemented. The site-specific geotechnical reports shall include all applicable recommendations included in the *Report of Geotechnical Investigation NBC Universal Evolution Plan* (March 2010) prepared by Shannon & Wilson, Inc. included as Appendix H to this Draft EIR. The site specific study shall determine which mitigation measures listed in Mitigation Measures F-3 to F-19 below are applicable for implementation of the Project as that term is

defined in the proposed City and County Specific Plans, the study is considering.

**Mitigation Measure F-2:** During construction, geotechnical observation and testing shall be completed during the placement of new compacted fills, foundation construction, buttresses, stabilization fills, ground improvement, and any other geotechnical-related construction for each project, as that term is defined in the City and County Specific Plans, in accordance with the City or County of Los Angeles requirements to the satisfaction of the applicable jurisdiction. The geotechnical firm performing these services for locations within the City of Los Angeles shall be approved by the City of Los Angeles when work is occurring within its jurisdiction.

## (2) Geologic Hazards

### *(a) Landslides and Slope Stability*

**Mitigation Measure F-3:** Slope stability hazards shall be mitigated by either reorienting the cut slopes, reducing the slope angle to the angle of the bedding or flatter, or by construction of buttress and stabilization fills. Site-specific geotechnical investigations shall be performed to the satisfaction to the applicable jurisdiction for the design of all cut and fill slopes in accordance with the City or County of Los Angeles requirements, as applicable.

**Mitigation Measure F-4:** The landslide hazard located above Barham Boulevard shall be mitigated, in accordance with the City of Los Angeles requirements, using techniques that may include, but shall not be limited to, the construction of a slough wall and a rockfall catchment fence at the base of the slope adjacent to Barham Boulevard. Should this approach be used at this location, the catchment fence shall be located on top of the wall and be at least four feet in height. There shall be at least four feet of horizontal distance between the slough wall and the face of the slope to permit access by a small skid loader for periodic clearing. In addition, the rock catchment fence shall be placed on top of the slough wall for an additional 3 feet to attain a minimum height of 7 feet from the adjacent grade and there shall be at least 8 feet of horizontal distance between the top of the fence and the adjacent slope. Furthermore, the slough wall shall be designed to support a lateral pressure equal to the pressure developed by a fluid with a density of 50 pounds per cubic foot. As an option to the aforementioned approach, the surficial stability hazard could also be mitigated with rock-netting placed over the face of the slope, implemented either alone or in conjunction with the slough wall and catchment fence.



**Mitigation Measure F-5:** Grading within the hillside areas shall address slope stability. Where favorable bedding exists, the slopes shall be constructed no steeper than a 2:1 (horizontal to vertical) inclination. If the bedding dips unfavorably out of the slopes, the slopes shall either be flattened to the angle of the bedding (or flatter), or the slopes shall be stabilized. The degree of stabilization would depend on the orientation of the bedding with respect to the final slope and the depth of the excavation. Where the bedding dips out of the slopes, buttress fills shall be provided. If the bedding is approximately parallel to the slopes, thinner stabilization fills will suffice. The design of the buttress or stabilization fills and specific design criteria for each slope shall be included to the satisfaction to the applicable jurisdiction in the site-specific geotechnical report prepared prior to construction of each project, as that term is defined in the City and County Specific Plans, in accordance with the City or County of Los Angeles requirements, as applicable.

*(b) Liquefaction*

**Mitigation Measure F-6:** Site-specific liquefaction hazard studies shall be required to the satisfaction to the applicable jurisdiction for each project, as that term is defined in the City and County Specific Plans, within a liquefaction hazard area in accordance with the City or County of Los Angeles requirements, as applicable. For areas with a high liquefaction potential, identified in Figure 177, where there is potential for more than four inches of settlement resulting from liquefaction, and areas of moderate liquefaction potential, where there is a potential for between one and four inches of settlement resulting from liquefaction, the liquefaction hazard shall be mitigated to the satisfaction to the applicable jurisdiction in accordance with the applicable City or County of Los Angeles requirements. Mitigation for high liquefaction potential could include ground improvement or deep foundations extending through the potentially liquefiable soils and structurally-supported floor slabs. Mitigation for moderate liquefaction potential could include ground improvement, deep foundations, or special foundation design procedures, such as extra reinforcement and strengthening of building foundations and floor slab systems.

*(c) Closed Landfill*

**Mitigation Measure F-7:** Deep foundations shall be provided for any structures located over waste in the closed landfill in accordance with the requirements of the County of Los Angeles. These foundations shall extend through the closed landfill and into the underlying bedrock. Downdrag loads resulting from decomposition and

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settlement of the closed landfill shall be added to the design loads on the piles.

### (3) Sedimentation and Erosion

Implementation of the mitigation measures set forth in Section IV.G.1, Water Resources - Surface Water of this Draft EIR would mitigate Project impacts with regard to sedimentation and erosion to less than significant levels. No further mitigations measures are required.

### (4) Landform Alteration

#### *(a) Cut and Fill*

**Mitigation Measure F-8:** Any required fill shall be placed in loose lifts not more than 8 inches thick and compacted to the standard as determined by the American Society for Testing and Materials (ASTM) Designation D1557 method of compaction. The fill shall be compacted in accordance with the applicable City or County of Los Angeles requirements to the satisfaction of the applicable jurisdiction. Cohesive fills shall be compacted to 90%. Granular, non-cohesive soil shall be compacted to at least 95%. Where deep fills are required a greater degree of compaction may be required to reduce the settlement of the completed fills.

**Mitigation Measure F-9:** The on-site excavated materials, less any debris or organic matter, may be used in required fills in accordance with the City or County of Los Angeles requirements, as applicable. On-site clayey soils shall not be used within one foot of the subgrade for floor slabs, walks, and other slabs. Cobbles larger than 4 inches in diameter shall not be used in fill. Any required import material shall consist of relatively non-expansive soils with an Expansion Index of less than 35. The imported materials shall contain sufficient fines (binder material) so as to be relatively impermeable and result in a stable subgrade when compacted. All proposed import materials shall be approved by the geotechnical consultant-of-record prior to being placed at the site.

#### *(b) Stockpiled Fill*

**Mitigation Measure F-10:** The stockpiled materials proposed to occur in the Mixed-Use Residential Area are to be in place for less than one year or if the stockpile is less than 40 feet in height, the stockpiled material shall be placed in lifts not more than two feet in thickness and rolled with heavy compaction equipment. If the stockpiled fill is

greater than 40 feet in height, the outer portion of the fill with a width equal to at least the height of the fill, shall be compacted to at least 90% and the interior core of the stockpile shall at least be track-rolled with heavy equipment. The side slopes of the stockpile fill, less than 40 feet in height, may be constructed as steep as 1½:1 (horizontal to vertical). Stockpile fill more than 40 feet in height shall not be constructed steeper than a 2:1 slope inclination. If the stockpiled fill is in place for less than one year and if the stockpile is less than 40 feet in height, normal City requirements for rainy weather erosion protection shall be implemented. If the stockpile is in place for more than one year or if the stockpile is more than 40 feet in height, drainage terraces shall be provided on all slopes. The terraces shall be at least 8 feet in width and spaced no further than 25 feet apart vertically.

*(c) Expansive Soils*

**Mitigation Measure F-11:** All concrete slabs on grade shall be underlain by at least one foot of non-expansive soil with an Expansion Index less than 35 to minimize the expansion potential. In addition, subsurface cutoff walls shall be provided between landscaped and hardscape areas. The cutoff walls shall consist of a concrete-filled trench at least six inches wide and two feet deep. The cutoff walls shall extend at least six inches below any adjacent granular non-expansive material or the paving base course. Drain lines shall also be installed adjacent to landscaped areas.

**Mitigation Measure F-12:** The geotechnical engineer-of-record shall be provided with a copy of the hardscape and landscaping plans in order to review in terms of movement of water and expansive soils prior to final design.

*(d) Fills (Engineered and Non-Engineered)*

**Mitigation Measure F-13:** During construction non-engineered fills shall be excavated, and replaced as compacted fill properly benched into suitable materials, to the satisfaction to the applicable jurisdiction, in accordance with the City or County of Los Angeles requirements, as applicable. In general, most of the excavated materials can be reused in the compacted fills. The suitability of the materials shall be confirmed during the site-specific geotechnical report prepared for the individual development.

**Mitigation Measure F-14:** For new buildings surface water runoff shall be removed by subdrains from behind building basement walls and retaining walls to prevent development of damaging hydrostatic

pressures and to avoid detrimental effects on the strength and compressibility of compacted fills, to the satisfaction to the applicable jurisdiction, in accordance with the City or County of Los Angeles requirements, as applicable.

**Mitigation Measure F-15:** If vegetative swales/filter strips are constructed, the following shall be completed to the satisfaction to the applicable jurisdiction, in accordance with the City or County of Los Angeles requirements, as applicable: (1) all vegetated treatment facilities shall be constructed with underdrains and, if needed, liners to restrict infiltration to the underlying compacted soils (some areas may not need to include a liner as these soils would effectively act as a liner until perforated pipes are able to drain percolated waters); and (2) collected and treated water from vegetative swales/filter strips shall either be discharged to the storm drain systems or potentially used for irrigation elsewhere on the Project Site.

#### (5) Reclaimed Water Tank

**Mitigation Measure F-16:** A site-specific geotechnical report with detailed geotechnical recommendations shall be completed prior to the final design and construction of the proposed reclaimed water tank in accordance with the applicable City or County of Los Angeles requirements to the satisfaction to the applicable jurisdiction.

**Mitigation Measure F-17:** If the reclaimed water tank proposed within the Mixed-Use Residential Area is constructed in the area indicated on Figure 179: (1) the slope adjacent to the currently proposed location shall be stabilized with a buttress fill equipped with a backdrain, (2) the tank shall be constructed at the top of the buttress fill and the base of the tank shall consist of a reinforced concrete foundation, and (3) grading for the buttress shall extend beneath the entire limits of the tank. If the tank is not fully buried, the tank as well as associated equipment shall be appropriately screened from view.

**Mitigation Measure F-18:** If the reclaimed water tank proposed within the Mixed-Use Residential Area is constructed in the area indicated on Figure 179, drainage shall be provided around and beneath the tank. The drainage shall consist of a perforated pipe between the tank walls with gravel backfill and a subdrain beneath the base of the tank. The subdrain shall consist of a layer of permeable gravel with drainage pipes. The drainage pipes and the wall drain shall drain to an approved drainage device. Provisions shall be made to capture any leakage resulting from a tank rupture with that leakage directed to an appropriate collection system.

**Mitigation Measure F-19:** If the reclaimed water tank addressed by Mitigation Measures F-17 and F-18 is not constructed and a series of smaller reclaimed water tanks are constructed in other locations of the Mixed-Use Residential Area, any geological hazards present at those locations shall be mitigated, in accordance with the applicable City or County of Los Angeles requirements to the satisfaction of the applicable jurisdiction and the findings, conclusions and recommendations of the site specific geotechnical report for the water tank development and the *Report of Geotechnical Investigation NBC Universal Evolution Plan* (March 2010) prepared by Shannon & Wilson, Inc. included as Appendix H to this Draft EIR.

## 6. Level of Significance After Mitigation

Implementation of the mitigation measures listed above and compliance with applicable regulations would reduce all project impacts related to geology and soils to a less than significant level.